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Author(s): Dutta, Anupam; Dutta, Probal

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PRICING OF IPOS: FURTHER EVIDENCE FROM SOUTH AFRICA

Anupam Dutta, Probal Dutta***

Abstract

We examine the long-term performance of 225 IPOs listed on the Johannesburg Securities Index (JSE) during the period from 1996 to 2006. The buy-and-hold abnormal return (BHAR) method and the calendar time portfolio (CTP) approach have been employed to measure the long-run performance of IPO stocks. The findings reveal that IPOs are highly underpriced when the abnormal returns are estimated by BHAR methodology. However, the use of control firm approach instead of market index for measuring abnormal performances significantly reduces the magnitude of this underpricing reported in previous studies on South African IPO stocks. Our major contribution to the literature is that we apply –for the first time- the calendar time portfolio approach to assess the aftermarket performance of IPOs listed on the JSE. In addition, we use control firm approach instead of market index to estimate the abnormal returns. These are the two significant cases which were not documented in previous research on measuring long-term performance of South African IPO stocks.

Keywords: IPOs, Market Efficiency, JSE

** Department Mathematics and Statistics, University of Vaasa, Finland*
*** Department of Accounting and Information Systems, Faculty of Business Studies, Jahangirnagar University, Savar, Dhaka-1342, Bangladesh*

1. Introduction

While investigating the long-run performance of initial public offerings (IPOs), a large number of empirical works conclude that IPOs do underperform the market in the long run. The extensive literature includes Aggarwal and Rivoli (1989), Ritter (1991), Loughran and Ritter (1995), Ritter and Welch (2002), Ljungqvist and Wilhelm (2003) for the U.S. market, Levis (1993) for the UK market, Ljungqvist (1997) for the German market, Gong and Sekhar (2001) for the Australian market, Wong and Chiang (1986) for the Singapore market, Alvarez and Gonzalez (2005) for Spanish market, Kirkulak (2008) for the Japanese market and so on. The authors of these papers document significant underpricing of IPO stocks.

Existing literature of IPO studies in South Africa also reports the long-term underpricing of initial public offerings. Neneh and Smit (2014), for instance, examine the long-horizon performance of 313 IPOs listed on the Johannesburg Securities Index (henceforth JSE) during the period from 1996 to 2007 and conclude that IPOs are underpriced over three- and five-year windows. Page and Reyneke (1997), however, assess the aftermarket performance of 118 IPOs listed between 1980 and 1991 on JSE. They document that IPOs do underperform the market. While investigating the aftermarket performance of IPOs on the JSE, M'kombe and Ward (2002) argue that investing in IPOs is not profitable in the long run.

However, none of these studies has taken into account the use of calendar time portfolio method to analyze the long-run performance following South African IPOs. Moreover, the calculation of return anomalies ignores the application of control firm approach. The studies mostly utilize markets index to examine the security price performance. Since Brav and Gompers (1997) as well as Fama (1998) argue that the underperformance of IPOs depends on the methodology used to assess the abnormal return, we employ both buy-and-hold abnormal return (BHAR) methodology and calendar time portfolio approach in analyzing the long-horizon aftermarket performance of initial public offerings. We construct control firms to estimate the abnormal stock returns as well. Additionally, we consider analyzing the power of the tests used in this study.

Our outcomes reveal that the post-IPO mean BHARs for one-, three- and five-year investment periods are -4.13%, -18.03% and -11.37% when the BHARs are calculated using the control firm approach and -7.2%, -23.02% and -16.5% when the market index is used to measure the BHARs. Although these results are similar to those obtained by Neneh and Smit (2014) and M'kombe and Ward (2002), the magnitude of mean BHAR is substantially reduced in our analysis. The use of control firm approach is likely to minimize such underperformances. However, the magnitude of this underpricing also gets reduced when calendar time portfolio approach is employed. In addition, simulations show that while detecting the

return anomalies, calendar time portfolio approach has more power than the BHAR method.

The rest of the paper will proceed as follows: Section 2 describes the data. Section 3 outlines the methodologies. Results are discussed in Section 4. Section 5 concludes.

2. Data

We examine the long-run performance of 225 IPOs listed on JSE during the period from January 1996 to December 2006. The data are collected from Thomson One. In addition, we obtain monthly returns, market value (MV) or size and book-to-market (BM) value data from DataStream as well. Table 1 reports the information on IPOs.

In order to measure the abnormal returns, we consider a size-BM-matched control firm in our empirical analysis. To identify such control firms is a 2-step procedure. In the first step, we identify all the firms with a market value of equity between 70% and 130% of the event firm at the most recent end of June. Then from this set of firms, we choose the firm with BM closest to that of the event firm as of the previous December. However, event firms issue IPOs, while a reference stock does not.

Table 1. Number of IPOs listed on JSE during 1996-2006

Year	Number of IPOs issued
1996	20
1997	35
1998	61
1999	40
2000	8
2001	8
2002	8
2003	6
2004	11
2005	11
2006	17

3. Methodology

3.1. Standardized Calendar Time Approach (SCTA)

Dutta (2014a) suggests a two-step procedure for constructing the calendar time portfolios. The first step involves the calculation of standardized abnormal returns for each of the sample firms. To do so, the abnormal returns for firm i are computed as ε_it=r_it-E(r_it);t=1,…,H, where r_it denotes the log return on event firm i in the calendar month t and E(r_it) is the expected return which is proxied by a size/book-to-market matched control firm and H is the holding period which equals 12, 36 or 60 months. In the second step, we estimate the event-portfolio residual variances using the H-month residuals computed as monthly differences of i-th event firm returns and control firm returns. Dividing ε_it by the estimate of its standard deviation yields the corresponding standardized abnormal return, say, z_it, for event firm i in month t. Now let N_t be the number of event firms in the calendar month t. We then calculate the calendar time abnormal return for portfolio t as:

$$CTAR_t = \sum_{t=1}^{N_t} x_{it} z_{it} \qquad (1)$$

where the weight x_it equals 1/N_t when the abnormal returns are equally-weighted and $\frac{MV_{it}}{\sum MV_{it}}$ when the abnormal returns are value-weighted by size.

Following the work of Dutta, each of the monthly CTARs is weighted by $1/\sqrt{\left(\sum_{t=1}^{N_t} x_{it}^2\right)}$. For instance, when the abnormal returns are equally weighted i.e., when $x_{it} = \frac{1}{N_t}$, then $1/\sqrt{\left(\sum_{t=1}^{N_t} x_{it}^2\right)} = \sqrt{N_t}$. This weighting approach is beneficial as it better reflects months in which there is heavy event activity versus months with low activity. Now the grand mean monthly abnormal return, denoted by $\overline{(CTAR)}$, is calculated as:

$$\overline{CTAR} = \frac{1}{T}\sum_1^T CTAR_t \qquad (2)$$

When measuring $\overline{(CTAR)}$, it might be the case that a number of portfolios do not comprise any event firm. We drop those months from our analysis. To test the null hypothesis of no abnormal performance, the t-statistic of $\overline{(CTAR)}$ is computed by using the intertemporal standard deviation of the monthly CTARs defined in equation (1). Dutta (2014b), however, documents that SCTA documents better power and specification than the conventional long-run event study methodologies.

3.2. Buy-and-Hold Abnormal Return (BHAR)

To check the robustness of the results, we also measure the BHARs. An H-month BHAR for event firm i is defined as:

$$BHAR_{iH} = \prod_{t=1}^{H}(1 + R_{it}) - \prod_{t=1}^{H}(1 + R_{Bt}) \qquad (3)$$

where R_it denotes the return on event firm i at time t and R_Bt indicates the return of a size/book-to-market matched control firm or market index.

To test the null hypothesis that the mean buy-and-hold return equals zero, the conventional t-statistic is given by:

$$t_{BHAR} = \frac{\overline{BHAR_H}}{\sigma(BHAR_H)/\sqrt{n}}$$

where $\overline{BHAR_H}$ implies the sample mean and $\sigma(BHAR_H)$ refers to the cross-sectional sample standard deviation of abnormal returns for the sample containing n firms.

However, Mitchell and Stafford (2000), Boehme and Sorescu (2002), Jegadeesh and Karceski (2009) argue that the BHAR approach does not control well for the cross-sectional correlation among individual firms in nonrandom samples and thus yields misspecified t-statistics. In addition, the test statistics based on BHARs also have this misspecification problem, since the distribution of BHARs suffers from skewness problem. Though bootstrapping alleviates the skewness problem to some extent, it does not address the cross-sectional dependence of return anomalies.

4. Results and Discussions

4.1 Standardized Calendar Time Approach Analysis

Table 2 details the long-run performance of IPO stocks over one-, three-, and five-year investment periods using the standardized calendar time approach. The results show that IPOs do underperform when the horizons are one and five years. However, the t-statistics are found to be insignificant at 5% level of significance for a three year holding period. In addition, when the portfolios are value-weighted by size, the anomalies tend to decrease for both one- and five- year windows. For example, for a one-year holding period, the abnormal returns produced by SCTA are 0.009 for equally weighted portfolios and .007 for value-weighted portfolios.

Table 2. Standardized calendar time approach analysis

Holding Period	Equally Weighted Portfolios	Value Weighted Portfolios
12 Months	-0.009 (3.26*)	-0.007 (3.14*)
36 Months	-0.001 (0.41)	- 0.008 (0.89)
60 Months	-0.012(2.62*)	-0.010 (3.11*)

*Note: Abnormal returns following IPOs are calculated for one-, three- and five-year investment periods using the standardized calendar time approach. Both equally- and value-weighted calendar time portfolios are considered. The abnormal performance is measured as the mean monthly difference between the returns of event-firm portfolios and the returns of control-firm portfolios. The values in the brackets indicate the t-statistics. The number marked with * suggest that the test is significant at 5% level of significance.*

4.2. Analysis of Long-Term Buy-and-Hold Abnormal Returns

Table 3 displays the results of BHAR analysis for one-, three-, and five-year holding periods. We report that the t-statistics based on BHARs are highly significant at 5% significance level. Moreover, the post-IPO mean BHARs for one-, three- and five-year windows are -4.13%, -18.03% and -11.37% when we measure the BHARs employing the control firm approach and -7.2%, -23.02% and -16.5% when the market index is considered to estimate the BHARs. Although these results are similar to those obtained by Neneh and Smit (2014) and M'kombe and Ward (2002), the magnitude of mean BHAR is markedly reduced in our analysis. The use of control firm approach most likely accounts for such reductions.

Table 3. Buy-and-hold abnormal returns analysis

Holding Period	Control Firm Approach	Market Index Approach
12 Months	-0.0413 (2.79*)	-0.072 (3.21*)
36 Months	-0.1803 (3.17*)	- 0.232 (2.68*)
60 Months	-0.1137 (3.01*)	-0.165 (3.34*)

*Note: This table indicates the buy-and-hold abnormal returns calculated for one-, three- and five-year investment periods. BHARs are calculated in two ways. In the first case, we subtract the buy-and-hold return of the reference stock from the buy-and-hold return of the corresponding IPO stock. In the second occasion, BHARs are estimated using the market index. The values in the brackets indicate the t-statistics. The numbers marked with * suggest that the test is significant at 5% level of significance.*

4.3. Power of the Tests

Prior studies such as Lyon et al. (1999) and Loughran and Ritter (2000) argue that calendar time portfolio approach lacks power. Dutta (2014a, 2014b), however, documents that standardized calendar time approach does not have this pitfall. Nonetheless, we assess the power of the tests considered in this study. In doing so, we randomly select 250 samples of 200 firms listed on the JSE over the period January 1996 to December 2006. For evaluating the power of the tests, we introduce a constant level of abnormal return ranging from -20% to 20% at an interval of 5% to event firms. Table 5 displays the proportion of 250 samples of 200 firms that reject the null hypothesis of no abnormal performance over a three-year window. Figure 1 also depicts the power of the tests. It should be noted that though only equally weighted portfolios are considered in the power analysis, our findings for value-weighted portfolios infer the same.

The results establish that the standardized calendar time approach yields more powerful t-statistics than the BHAR method. For instance, with 10% (-10%) per year abnormal returns, the rejection rates are 77% (53%) for SCTA and 57% (42%) for the BHAR approach. We, therefore, conclude that the standardized calendar time approach has more power to detect the abnormal performance than the BHAR methodology.

Table 4. Power of the tests

Methods	Induced Level of Abnormal Return (%) over 3 Years								
	-20	-15	-10	-5	0	5	10	15	20
BHAR	0.91	0.72	0.42	0.11	0.05	0.16	0.57	0.81	0.97
SCTA	1.00	0.88	0.53	0.14	0.05	0.23	0.77	0.94	1.00

Note: This table indicates the percentages of 250 random samples of 200 firms that reject the null hypothesis of no abnormal returns over a three-year holding period. We add the levels of annual abnormal return indicated in the column heading. It should be noted that though only equally weighted portfolios are considered in the power analysis, our findings for value-weighted portfolios conclude the same.

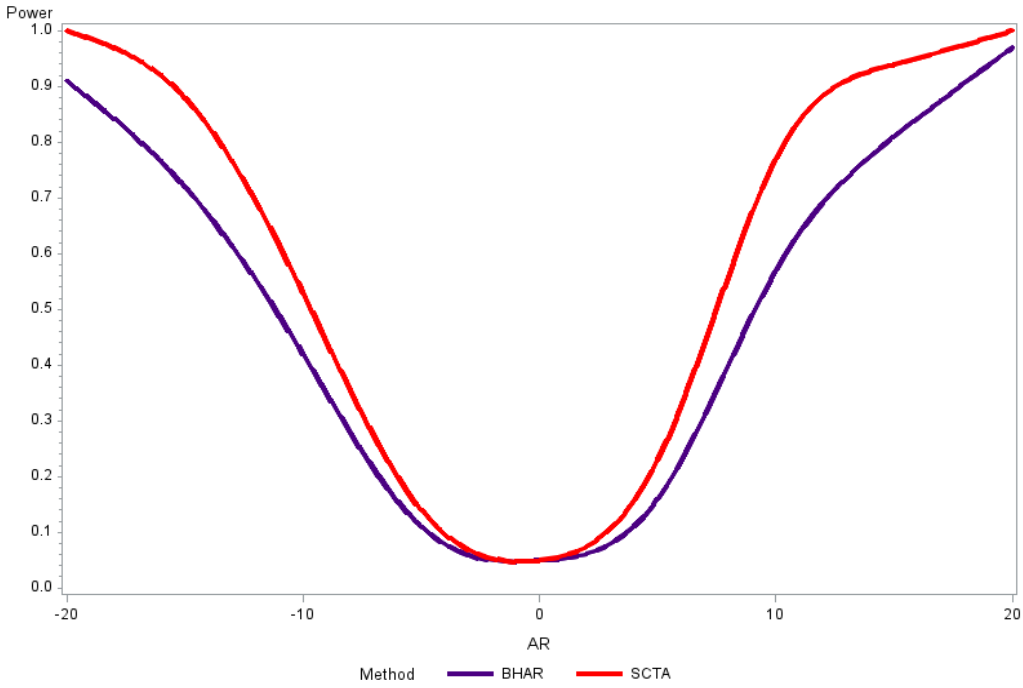

Figure 1. Simulated power of the tests. This figure represents the percentages of 250 random samples of 200 firms that reject the null hypothesis of no abnormal performance over a three-year horizon. The horizontal axis shows the induced level of annual abnormal returns (%), while the rejection rates are displayed in the vertical axis.

5. Conclusions

The study makes a modest attempt to reassess the long-term performance of initial public offerings in South Africa. Our contribution is two-fold. First, although previous studies on South African IPO stocks ignore the use of calendar time portfolio approach, we apply both BHAR methodology and

calendar time portfolio approach to assess the aftermarket performance of IPOs listed on JSE during 1996 to 2006. Second, we use control firm approach rather than market index to estimate the abnormal returns. This can be considered as a major contribution, since the existing literature on long-term performance of South African IPO stocks frequently uses market index as the proxy for expected return.

Our empirical analysis reports significant long-run underpricing of IPO stocks when the abnormal performance is investigated using the buy-and-hold abnormal return methodology. However, the application of control firm approach markedly reduces the magnitude of IPO underperformances reported in previous studies on South African IPO stocks. The results further show that the calendar time portfolio approach does not reject the efficient market hypothesis in all the cases considered. In addition, simulated results show that the CTP approach documents better power than the BHAR method in case of identifying the anomalies. Hence we, like Fama (1998) and Mitchell and Stafford (2000), strongly recommend the use of calendar time portfolio approach to analyze the long-term return anomalies.

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